



Subject card

Subject name and code	High-Voltage Technologies, PG_00038488						
Field of study	Electrical Engineering						
Date of commencement of studies	February 2023	Academic year of realisation of subject			2023/2024		
Education level	second-cycle studies	Subject group					
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	2	Language of instruction			Polish		
Semester of study	3	ECTS credits			2.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Katedra Elektrotechniki i Inżynierii Wysokich Napięć -> Faculty of Electrical and Control Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Piotr Leśniak					
	Teachers	dr inż. Piotr Leśniak					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	0.0	0.0	30
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours		Self-study		SUM
	Number of study hours	30	5.0		15.0		50
Subject objectives	The aim of the course is to educate specialists with knowledge in the field of innovative approaches to the analysis, construction and operation of high - voltage electrical, electromechanical, power and power electronic devices, as well as with the skills to conduct laboratory tests.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	K7_W11	- the student knows the types of electrical, electromechanical, power and power electronic devices, - the student knows the rules for selecting the above. devices in terms of their operation, - the student knows high-voltage technologies and is able to indicate the possibilities of their use.			[SW2] Assessment of knowledge contained in presentation		
	K7_U03	- the student searches for the necessary information on the basis of the literature, - the student makes a critical assessment of the available information, - the student formulates conclusions, the student indicates other directions of obtaining information and expanding knowledge.			[SU3] Assessment of ability to use knowledge gained from the subject		

Subject contents	<p>Lecture:</p> <ol style="list-style-type: none"> 1. Comprehensive monitoring of the operation of the HV power line. Carrying out live work. 2. Methods of locating damage to MV cable lines. Lightning arresters and surge arresters. 3. Plasma technologies. Modern methods of ozone production. 4. Unusual conductive materials - voltage-controlled liquids. 5. Comparative analysis of the possibilities of transmitting electricity using AC and DC current. 6. The impact of increasing the load capacity of a long-term HV power line on its operational parameters. GIS and enclosed switchboards with air insulation. 7. Possible applications of superconducting cables in HV systems. 8. The use of superconductors in high voltage technology. 9. Optimization of the operation of HV devices in testing and measurement technology and their electromagnetic compatibility in the zone of impact of strong electric discharges. 10. Participation of high-voltage technologies in the concept of industry 4.0. <p>Lab:</p> <ol style="list-style-type: none"> 1. Measurement and analysis of voltage distribution on insulators at alternating voltage. 2. Study of the influence of temperature variability on the conduction characteristics of the semiconductor structure of the varistor. 3. Measurements of the variability of the magnetic field generated in the selected working space. 4. Testing and analysis of electrorheological fluid parameters. 5. Investigation of the phenomenon of electrical discharge and the course of partial discharges in induction transformers. 		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Laboratory	60.0%	50.0%
	Lecture	60.0%	50.0%

Recommended reading	Basic literature	<p>1. Z. Flisowski: Technika wysokich napięć, WNT Warszawa 2017.</p> <p>2. Ciok Z.: Procesy łączeniowe w układach elektroenergetycznych, WNT Warszawa 1983.</p> <p>3. Ciok Z., Maksymiuk J., Pochanke Z., Zdanowicz L.: Badanie urządzeń energoelektrycznych, WNT, Warszawa 1992.</p> <p>4. Inżynieria wysokich napięć w elektroenergetyce, t.1 i t.2. Praca zbiorowa pod red. Hanny Mościckiej - Grzesiak. Wydawnictwo Politechniki Poznańskiej, Poznań, 1999.</p> <p>5. J. Maksymiuk, Z Pochanke: Obliczenia i badania diagnostyczne aparatury rozdzielczej, WNT Warszawa 2001.</p> <p>6. H. D. Stryczewska: Technologie plazmowe w energetyce i inżynierii środowiska, Wydawnictwo Politechniki Lubelskiej, Lublin 2009.</p> <p>7. A. Wiszniewski: Przekładniki w elektroenergetyce, WNT Warszawa 1992.</p> <p>8. Kamińska - Benmechrenene A.: Wytwarzanie i modelowanie plazmy w plazmotronach łukowych, Wydawnictwo Politechniki Poznańskiej, Poznań, 1998.</p>
	Supplementary literature	<p>1. A. Haddad, D. Warne: Advances in high voltage engineering. Institution of Electrical Engineers 2004.</p> <p>2. Z. Kołaciński: Thermodynamics of short - arc plasma. PWN Warszawa 1989.</p> <p>3. Kuffel E., Zaengl W.S., Kuffel J.: High Voltage Fundamentals. Newnes 2005.</p>
	eResources addresses	<p>Adresy na platformie eNauczanie: Technologie Wysokonapięciowe [Stacjonarne 2023/24] - Moodle ID: 36092 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=36092</p>
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> 1. Introduce and specify the topics of: Monitoring the operation of power lines and live work performed on them. 2. Discuss the methods of locating damage to MV cable lines. 3. Describe what plasma technologies are and what their applications are. 4. Provide the characteristics and properties of electrorheological fluids. 5. What are the possibilities of increasing the current capacity of modern power lines? 6. Discuss contemporary development trends in superconductors in the power industry. 7. What is the electromagnetic compatibility of HV devices used in testing and measurement technology? 8. What is the share of high-voltage technologies in the concept of industry 4.0? 	

Work placement	Not applicable
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